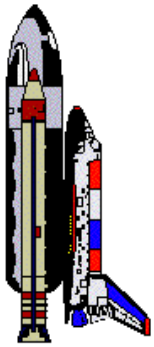
Ask Dr. ALOHA:

An ALOHA Scavenger Hunt

Remember the scavenger hunts you used to do when you were a kid? Well, here's an ALOHA scavenger hunt. It's in the form of a list of questions. You can answer most of the questions by searching for the answers in ALOHA's online helps. To answer several questions, you'll need to experiment a little with ALOHA. You can answer all the questions if you're using ALOHA 5.2, the latest version of the model, but if you haven't yet upgraded your copy of ALOHA, you also should be able to answer most of the questions using ALOHA 5.1. Once you think you've found all the answers, or you're ready to give up, turn to the end of this article to see explanations for all the questions.

The questions

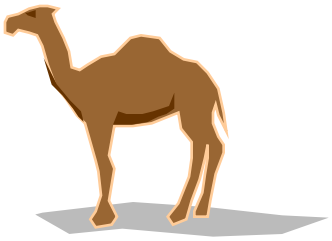


1. A space shuttle launch from Cape Canaveral is scrubbed when a booster rocket engine leaks hydrazine. You're called in to help with the response. As you begin setting up ALOHA, you recognize that the spill is a clear case of a stand-alone puddle. One of the astronauts tells you that the puddle is approximately circular, with a diameter of about 20 feet. But ALOHA needs to know the puddle area. What is it?

2. A release of diethyl dichlorisilane can be difficult to model in ALOHA, because this chemical can react with water or with moist air. When the reaction occurs, what are the reaction products? (Warning—this question is easy to answer if you have ALOHA 5.2, but hard otherwise.)

3. You have been detailed to Ulaanbaatar, the capital of Mongolia. Now you need to use ALOHA during a response drill. But first, you need to add Ulaanbaatar to the city library. To do this, you need to enter the offset of the local time at this city from Greenwich Mean Time. That offset should be in units of hours. Should it be negative or positive?

4. As a first responder at a chemical accident in downtown Washington, D.C., you are being interviewed live and on-the-air by Sam Donaldson. When you show him ALOHA's Concentration-by-Time graph for the Russian Embassy, Sam asks "To make this concentration prediction, does ALOHA assume that the windows and doors of the embassy are open or closed?" What do you tell him?



5. It’s high noon and 100°F, and the only shade you can find is behind somebody’s camel. You’re out in the middle of the deserts of Saudi Arabia, helping a crack team of oil fire experts. On the way to an oil fire, the team encounters a pipeline leaking acrolein. Should you choose the Pipe option to model this release in ALOHA? Why or why not?

6. A school is downwind of a hazardous chemical release, and about one-quarter mile away. But unless the wind direction shifts, the school isn't in the direct path of the chemical gas cloud; it's off to the side. However, you're the school principal, and you would like to know how high the gas concentration at the school might rise if the wind were to shift to blow directly toward the school. To find this out, would you use fixed or relative coordinates to enter the location of the school into ALOHA?

7. What's the source of most of the physical property information in ALOHA's chemical library?

8. You're standing on the shore of Lake Superior. You notice that the wind has picked up a little: small trees in leaf have begun to sway, and you can see crested wavelets forming out on the lake. What's the approximate range of the wind speed in knots?

9. It's a dark and foggy night in London, where you're helping Scotland Yard on an important case. The investigation team has discovered a pool of spilled toluene in a parking lot. Can you use ALOHA to model this release?

10. You're in Seattle and it's lunchtime. What's the approximate air exchange rate within single-storied, sheltered houses, if the weather conditions are as follows:

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Wind: 5 knots from w at 3 meters     No Inversion Height
Stability Class: D                   Air Temperature: 65° F
Relative Humidity: 50%               Ground Roughness: Urban or forest
Cloud Cover: 10 tenths
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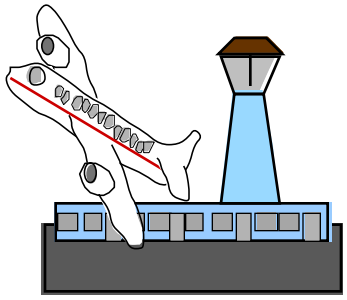


11. You’re between flights at O’Hare International Airport, laptop computer in hand, when an accidental chemical spill occurs on one of the runways. You offer to run ALOHA. To get the best estimates possible from the model, you decide to enter the most accurate estimate of ground roughness length (Z_0) that you can. What value would you use?

12. You’re looking at an ALOHA Concentration graph for a location very close to the source. ALOHA estimates the maximum concentration at that location to be

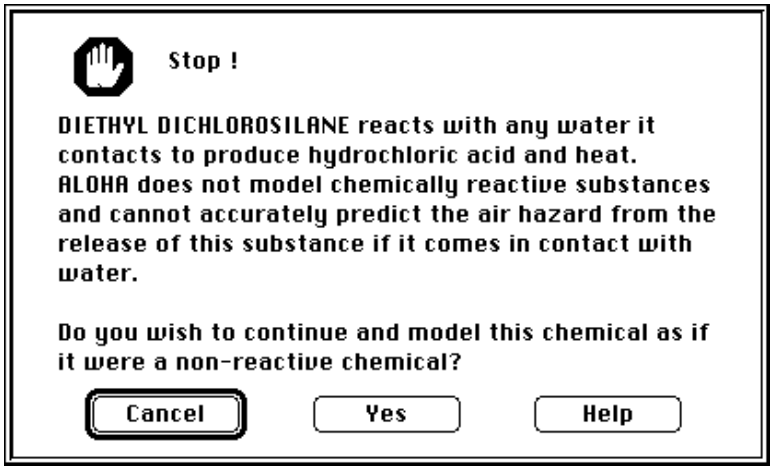
1.2e5 ppm. How would you write that number in decimal notation? (Examples of numbers in decimal notation are 5, 1698, and 3.2.)

13. Give an example of a situation when you might consider overriding ALOHA's choice of stability class. (You can override ALOHA's stability choice only in ALOHA 5.2, not in earlier versions.)

The answers

1. 314 square feet. To obtain this value, divide the diameter in half to obtain the radius. Square the radius, then multiply this value by pi, 3.14, to obtain the area. Since the diameter is in units of feet, the area is in units of square feet. (ALOHA 5.2's "Puddle size and amount" help topic contains directions for computing area from diameter.)

2. Hydrochloric acid and heat. To answer this question, choose diethyl dichlorosilane from ALOHA 5.2's chemical library. ALOHA will alert you about the possible water reaction, and will list the reaction products.

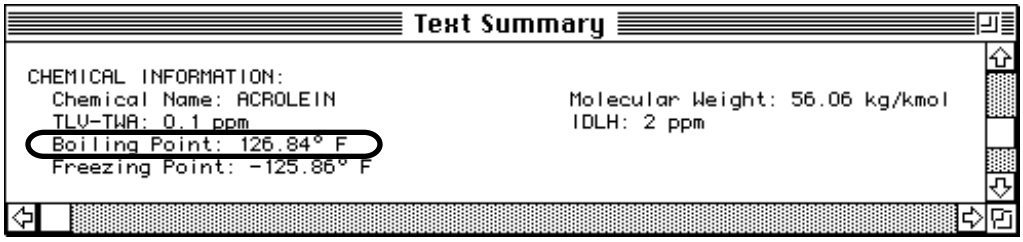


3. Negative. This time offset value should be positive if the location is in the western hemisphere (North and South America), and negative if it's in the eastern hemisphere (Europe, Africa, and Asia). (Check the "Foreign location input" help topic to see this information.)

4. When ALOHA estimates infiltration rate into a building, it assumes that the building's doors and windows are closed. (Check the "Building type" help topic to see this information.)

5. You should not choose the Pipe option, because acrolein is a liquid at 100°F, and the Pipe option is just for pressurized gas pipelines. You can quickly find this out by choosing acrolein from ALOHA's chemical library: on the Text Summary screen, you'll then see acrolein's boiling point, 126.84° F, as shown

below (under typical atmospheric pressures, a chemical is a liquid when it's at a temperature above its freezing point and below its boiling point). You might try the Tank option and model the pipe as a long, thin horizontal tank.



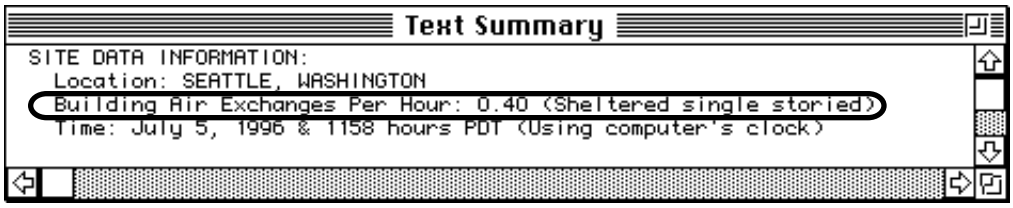
6. You would use relative coordinates of one-quarter mile downwind and zero miles crosswind. Check the "Concentration and dose location" help topic for an explanation of the two kinds of coordinates ALOHA uses and when you might want to choose one or the other.

7. The source of most of the chemical information in ALOHA is the DIPPR database, an electronic database compiled by the Chemical Engineering Department of the Pennsylvania State University for the Design Institute for Physical Property Data (DIPPR) of the American Institute of Chemical Engineers.

8. 17–21 knots (8–11 meters per second). Check the "Wind speed estimate" help topic to see a table you can use whenever you need to estimate wind speed from environmental cues.

9. No, not when it's foggy (and not when it's raining or snowing, either). (Check the "Rain, fog, or snow" help topic to see this information.)

10. 0.40 exchanges per hour. ALOHA computes this air exchange rate for you once you perform the following steps. First, from the **SiteData** menu, choose **Building Type...**. Click both **Single storied building** and **Sheltered surroundings (trees, bushes, etc.)**. Next, from the **SiteData** menu, choose **Location...**, then choose **Seattle, Washington** from the alphabetical city list. Third, from the **SetUp** menu, choose **Atmospheric**, then choose **User input...** from the hierarchical menu. Enter the weather information for Seattle described in the question. Once you have completed these steps, you'll see the building exchange rate on the Text Summary window, as shown below.



11. 0.002 centimeters. To find this value, check the ground roughness length table shown in the "Ground roughness" help topic. The value for "Smooth tarmac (airport runway)" is the best choice.

12. It's 120,000 ppm. To learn how to convert a number such as 1.2e5, which is in exponential notation, to the more familiar decimal notation, check ALOHA 5.2's "Numeric input format" help topic. ALOHA displays its results in exponential notation whenever numbers are too large to display in decimal notation. Exponential notation is a way of displaying a number as a digital number multiplied by a power of 10. In the number 1e5, for example, 1 is the digital number and 5 is the power to which 10 is taken. Interpret 1e5 as "1 times the quantity 10 taken to the power of 5," which equals 100,000 in decimal notation. (Likewise, interpret 1e-5 as "1 times the quantity 10 taken to the power of -5," which equals 0.00001 in decimal notation.) Interpret 1.2e5 as "1.2 times 10 taken to the power of 5," or 120,000. ALOHA accepts numerical input in exponential form, and it displays its results in exponential notation whenever numbers are too large to display in decimal notation.

13. Check ALOHA 5.2's "Overriding the stability class table" help topic to learn about two possible situations when you might want to override ALOHA's choice:

- The atmosphere over a large body of water or a snow-covered landscape sometimes may be more stable than would be expected for a given combination of wind speed, cloud cover, and time of day. If you are modeling a release over water, then, you sometimes might wish to choose a more stable class than ALOHA chooses for you.
- E and F stability conditions normally exist only at night, but under some conditions may be appropriate choices for daytime stability class.

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